

# CRS Report for Congress

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## Navy Network-Centric Warfare Concept: Key Programs and Issues for Congress

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### Summary

Network-centric warfare (NCW) is a key element of the Department of the Navy's effort to transform itself to meet 21<sup>st</sup> Century military challenges. NCW focuses on using information technology to link together Navy ships, aircraft, and shore installations into highly integrated networks. NCW could significantly improve U.S. naval capabilities and lead to substantial changes in naval tactics, doctrine, and organization. Key programs for implementing NCW include the Cooperative Engagement Capability (CEC), the Naval Fires Network (NFN), the IT-21 program, and ForceNet. A related program is the Navy-Marine Corps Intranet (NMCI). Congress has closely followed and expressed concern for some of these programs, particularly NMCI. This report may be updated if developments warrant.

### Network-Centric Warfare

The concept of network-centric warfare (NCW) emerged in the late 1990s and is a key element of the Department of the Navy's (DoN's) effort to transform itself to meet 21<sup>st</sup> Century military challenges.<sup>1</sup> NCW focuses on using advanced information technology (IT) – computers, high-speed data links, and networking software – to link together Navy ships, aircraft, and shore installations into highly integrated local and wide-area networks. Within these networks, Navy and Marine Corps personnel will share large amounts of critical information on a rapid and continuous basis. DoN believes that NCW will dramatically improve naval combat capability and efficiency.<sup>2</sup>

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<sup>1</sup> For more on naval transformation, see CRS Report RS20851, *Naval Transformation: Background and Issues for Congress*, by Ronald O'Rourke. Washington, 2003. (Updated periodically) 6 p.

<sup>2</sup> For discussions of NCW, see Alberts, David S., *et al.* *Network Centric Warfare, Developing and Leveraging Information Superiority*. Washington, Department of Defense, 1999. 256 p.; Cipriano, Joseph R. A Fundamental Shift in the Business of Warfighting. *Sea Power*, March 1999: 39-42; Bender, Bryan. Buying Into Networked Warfare. *Jane's Defence Weekly*, May 13, (continued...)

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## Key NCW Programs

Key programs for implementing NCW include the Cooperative Engagement Capability (CEC) program, the Naval Fires Network (NFN), the IT-21 investment strategy, and the ForceNet program. A related program is the Navy-Marine Corps Intranet (NMCI). Each of these is discussed below. In addition to these programs, the Navy in June 2002 established a new Naval Network Warfare Command (NETWARCOM), headed by an admiral, to be the central operational authority responsible for coordinating all IT, information operations, and space requirements and operations within the Navy.

**CEC.** The Cooperative Engagement Capability (CEC) system links Navy ships and aircraft operating in a particular area into a single, integrated air-defense network in which radar data collected by each platform is transmitted on a real-time (i.e., instantaneous) basis to the other units in the network. Each unit in the CEC network fuses its own radar data with data received from the other units. As a result, units in the network share a common, composite, real-time air-defense picture. CEC will permit a ship to shoot air-defense missiles at incoming anti-ship missiles that the ship itself cannot see, using radar targeting data gathered by other units in the network. It will also permit air-defense missiles fired by one ship to be guided by other ships or aircraft. The Navy wants to install the system on aircraft carriers, Aegis-equipped cruisers and destroyers, selected amphibious ships, and E-2C Hawkeye carrier-based airborne early warning aircraft over the next several years.<sup>3</sup> The system has potential for being extended to include Army and Air Force systems.

Tests of CEC aboard Navy ships in 1998 revealed significant interoperability (i.e., compatibility) problems between CEC's software and the software of the air-defense systems on some ships, particularly surface combatants equipped with the Baseline 6 version (then the most recent version) of the Navy's Aegis air defense system. In response, the Navy undertook a major two-year effort to identify, understand, and fix the problems. The CEC system, with the new fixes, passed its technical evaluation (TECHEVAL) testing in February and March 2001 and final operational evaluation (OPEVAL) testing in April and May 2001. In April 2002, DoD approved the program to enter "Milestone III" in the acquisition process, and approved production of CEC systems for FY2002 and FY2003 at a rate of 5 units per year. A further "Milestone B" review of the program was scheduled for April 2003.

Raytheon has been the primary CEC contractor but faced potential competition from two firms – Lockheed and a small firm called Solipsys – for developing the next version of CEC, called CEC Block II. Solipsys had devised an alternative technical approach to CEC, called the Tactical Component Network (TCN), which it said would reduce the

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<sup>2</sup> (...continued)

1998; West, Leslie. Network-Centric Warfare Realizes Its Promise. *Sea Power*, March 1998: 38-40; and Cebrowski, Arthur K., and John J. Garstka. Network-Centric Warfare: Its Origins and Future. *U.S. Naval Institute Proceedings*, January 1998: 28-35.

<sup>3</sup> For descriptions of CEC, see Balisle, Phil. CEC Provides Theater Air Dominance. *U.S. Naval Institute Proceedings*, May 2002: 60-62; Busch, Daniel, and Conrad J. Grant. Changing The Face of War. *Sea Power*, March 2000, 37-39; O'Driscoll, M. [Michael] J., and J. [Jerry] A. Krill. Cooperative Engagement Capability. *Naval Engineers Journal*, March 1997: 43-57.

amount of data-transmission bandwidth capacity required by CEC and thereby help the Navy contend with limitations on available bandwidth capacity. Solipsys entered into a teaming arrangement with Lockheed to offer TCN to the Navy as the technical approach for Block II. Raytheon proposed staying with the current technical approach for Block II, arguing that the Navy had already invested heavily in this approach, and that Raytheon had since improved it to reduce its use of bandwidth.

In late-December 2002, Raytheon announced that it had agreed to purchase Solipsys. The acquisition is undergoing antitrust review. In early-February 2003, Raytheon and Lockheed announced that they had formed a team to compete for the development of Block II. Since Solipsys and Lockheed were generally considered to be Raytheon's strongest potential competitors for Block II, some observers have expressed concern that these developments will reduce or eliminate the Navy's ability to effectively use competition as part of its acquisition strategy for Block II.<sup>4</sup>

**NFN.** The Naval Fires Network links naval forces operating in an area into a single real-time targeting network for coordinating gun and missile fire to attack surface and land targets, particularly time-critical targets. The Navy experimented with NFN in several exercises and is now working to accelerate the introduction of the system into the fleet. Concerns have been expressed that NFN, like CEC, may use significant amounts of the Navy's limited amount of available bandwidth. As of December 2002, the Navy reportedly had installed versions of the NFN system aboard the aircraft carrier Lincoln, the amphibious assault ships Essex and Bellau Wood, and the command ship Blue Ridge, and had installed an additional system in Bahrain, where the Navy's 5<sup>th</sup> Fleet is headquartered.<sup>5</sup> Additional NFN systems could be provided by either Northrop Grumman or an industry team composed of BAE, Lockheed, and Raytheon. The Navy has not clarified whether it intends to have these two sources compete for future NFN installations or award an NFN contract to one of them on a sole-source basis.

**IT-21.** IT-21, which stands for IT for the 21<sup>st</sup> Century, is the Navy's investment strategy for procuring the desktop computers, data links, and networking software needed to establish an intranet for transmitting tactical and administrative data within and between Navy ships. The IT-21 network uses COTS desktop computers and networking software that provide a multimedia (text, data, graphics, images, voice, and video) organizational intranet similar to the Capitol Hill intranet or corporate intranets. The Navy states that "IT-21 provides the common backbone for command, control,

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<sup>4</sup> Keeter, Hunter. Navy Acquisition Chief Outlines Concern For CEC Program. *Defense Daily*, February 18, 2003; Hodge, Nathan. CEC Program Chief Sees 'Level Playing Field'. *Defense Week*, February 18, 2003: 2; Ma, Jason. Rivals Raytheon, Lockheed Team Up For CEC Block II Contract. *Inside the Navy*, February 10, 2003; Ma, Jason. Raytheon: CEC Block II Would Cut Redundant Data, Save Bandwidth. *Inside the Navy*, February 10, 2003; Hodge, Nathan. Raytheon, Lockheed Martin For CEC Juggernaut. *Defense Week*, February 10, 2003: 2; Keeter, Hunter. Raytheon, Lockheed Martin Team, Rather Than Compete On CEC Program. *Defense Daily*, February 6, 2003.

<sup>5</sup> [Short items entitled] For Want of a Nail... [and] ... Present Commitment. *Defense Daily*, December 18, 2002; Hodge, Nathan. Navy Takes New Network-Centric Tool To Sea. *Defense Week*, August 12, 2002; Nagle, David. Naval Fires Network: The Transformation of Naval Warfare. *Navy News Service*, May 17, 2002; Woods, Randy. Abraham Lincoln Carrier Will Deploy With Full Naval Fires Suite. *Inside the Navy*, March 18, 2002.

communications, computers and intelligence systems to be linked afloat, ashore, and to the Internet.”<sup>6</sup> The Navy plans to complete the IT-21 network by FY2007. The Navy believes IT-21 will significantly improve U.S. naval warfighting capability and achieve substantial cost reductions by significantly reducing the time and number of people required to carry out various tactical and administrative functions.<sup>7</sup>

**ForceNet.** ForceNet (also typed as FORCEnet), which emerged as a named concept in 2002 and is still being defined, is the Navy’s overall approach for linking various networks that contribute to naval NCW into a single capstone information network for U.S. naval forces. The Navy has highlighted ForceNet as being at the center of its Sea Power 21 transformation vision, and states that ForceNet “is the operational construct and architectural framework for naval warfare in the information age which integrates warriors, weapons, sensors, networks, command and control, and platforms into a networked, distributed combat force.... FORCEnet is the implementation of network centric warfare in the naval services and will provide the means for an exponential increase in naval combat power.”<sup>8</sup> The conference report (H.Rept. 107-732 of October 9, 2002) on the FY2003 defense appropriations bill (H.R. 5010/P.L. 107-248) expressed concern about “the lack of specificity and documentation on the program,” and directed the Navy to submit a detailed report on it by May 1, 2003. (page 279).

**NMCI.** The Navy-Marine Corps Intranet (NMCI) is a corporate-style intranet that will link more than 300 Navy and Marine Corps shore installations in much the same way that the IT-21 effort will link together Navy ships.<sup>9</sup> When completed in 2003, NMCI will include a total of 365,070 computer work stations, or “seats.” In October 2000, the Navy awarded an industry team led by Electronic Data Systems (EDS) Corporation a \$6.9 billion, 5-year contract for installing, supporting, and periodically upgrading the NMCI. In October 2002, Congress, through P.L. 107-254, authorized a 2-year extension to this contract. A total of 160,000 NMCI seats have been authorized; as of February 24, 2003, a total of 58,910 had been “cut over” to the system. The Navy plans to have all 365,070 seats implemented by the end of FY2003, but the system must pass certain tests and reviews before it can be fully implemented.<sup>10</sup> The Administration is requesting \$1.6

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<sup>6</sup> U.S. Department of the Navy. *Highlights of the Department of the Navy FY 2004 Budget*. Washington, 2003. p. 3-11.

<sup>7</sup> For more on IT-21 and the Navy-Marine Corps Intranet (NMCI), see Clemens, Archie. Standby for Big Reform – A Navy-Marine Corps Intranet. *Navy Times*, March 6, 2000: 58; Kreisher, Otto. Breaking Down the Barriers. *Sea Power*, March 2000: 34-36; Clemens, Archie. It’s More Than E-Mail. *U.S. Naval Institute Proceedings*, February 2000: 56-58; Dawson, Cutler J., et al. The IT-21 Advantage. *U.S. Naval Institute Proceedings*, December 1999: 28-32.

<sup>8</sup> *Highlights of the Department of the Navy FY 2004 Budget*, op cit., p. 1-6. See also p. 3-12.

<sup>9</sup> For a general discussion of NMCI, see Munns, Charles. A Global Navy Needs a Global Network. *U.S. Naval Institute Proceedings*, January 2003: 60-62.

<sup>10</sup> *Highlights of the Department of the Navy FY 2004 Budget*, op cit., p. 4-14 and 4-15; Ma, Jason. NMCI Meets SLA Goals, Anticipates Approval For 150,000 More Seats. *Inside the Navy*, February 24, 2003; EDS Gets Go-Ahead For Navy Network Project. *Los Angeles Times*, January 1, 2003; Ma, Jason. Munns Expects Authorization From Pentagon For 160,000 NMCI Seats. *Inside the Navy*, December 16, 2002; Keeter, Hunter. Munns: Independent Analysis Supports (continued...)

billion in FY2004 and a total of \$9.5 billion in the FY2004-FY2009 Future Years Defense Plan (FYDP) for the NMCI program.

The 106<sup>th</sup> Congress expressed concern over the difficulty of identifying the total cost of the NMCI effort in Navy budget documents, the Navy's ability to finance NMCI effort without disrupting other important Navy programs, the pace at which the Navy planned to implement NMCI, the Navy's ability to properly structure and manage the huge NMCI contract (the largest networking-services IT contract undertaken by a federal agency), the potential impact of NMCI implementation on employees of current naval networking and telecommunications systems, and whether the network should be extended to cover installations in the Marine Corps, which already had its own service-wide network.

In response, the Navy took actions to improve the visibility of NMCI costs in its budget, stated that the NMCI would be financed to a large degree using funds programmed for older IT procurement programs that the NMCI will supercede, stated that implementing NMCI would have only a small net employment impact, and argued that implementing NMCI in the Marine Corps as well as the Navy would result in greater efficiencies and lower overall costs for the two services. At Congress' direction, the plan for implementing NMCI was restructured to begin with a smaller number of initial installations, so that the success of the NMCI effort could be more carefully assessed before the program was expanded to cover larger parts of the Navy and the Marine Corps.

The 107<sup>th</sup> Congress expressed substantial concerns regarding the implementation and testing of the NMCI system. Section 362 of the conference report (H.Rept. 107-333 of December 12, 2001) on the FY2002 defense authorization act (S. 1438/P.L. 107-107) permitted the Navy to proceed with the NMCI project only after meeting certain testing requirements. The provision also required the Navy to submit a report on the status of NMCI testing and the implementation of the NMCI network, and to identify a single individual whose sole responsibility will be to direct and oversee the NMCI program. (The Navy in February 2002 announced that it had created a single program office to manage the NMCI program, headed by an admiral. An NMCI senior executive council headed by the Navy's acquisition executive will provide senior-level review of the program office.<sup>11</sup>) The provision required GAO to study the impact of NMCI implementation on the rate structure of naval shipyards and other repair depots. (GAO submitted its report [GAO-03-33] on October 31, 2002.) The conference report also expressed concern about delays in implementing the program and the resulting shortage of data about the viability and performance of NMCI. (See pages 55-57 and 641-642.)

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<sup>10</sup> (...continued)

NMCI Proceeding To 160,000 'Seats.' *Defense Daily*, December 16, 2002; Capaccio, Tony. EDS Can Proceed On Largest Military Computer Program. *Bloomberg.com*, December 12, 2002; Caterinicchia, Dan. NMCI Earns Kudos For Easing Software Rollout. *Federal Computer Week*, November 11, 2002; Merle, Renae. Navy Project Buffeted. *Washington Post*, October 17, 2002: E1.

<sup>11</sup> Bohmfalk, Christian. Navy Creates NMCI Program Office, Responding to Congress' Demand. *Inside the Navy*, February 11, 2002; Keeter, Hunter. NMCI TO Get Own Program Office, Consolidated Management. *Defense Daily*, February 6, 2002: 10.

The House Appropriations Committee, in its report (H.Rept. 107-532 of June 25, 2002) on the FY2003 defense appropriation bill (H.R. 5010/P.L. 107-248), commented extensively on the NMCI program, expressing concerns over the incorporation of “legacy” computer programs into the network and the adequacy of the testing program. (pages 198-199) The conference report on the bill (H.Rept. 107-732 of October 9, 2002) expressed continuing concerns for the NMCI program and included a provision (Section 8118) prohibiting the Navy from ordering additional seats beyond the 160,000 already authorized until certain conditions are met. (pages 48, 106-107, and 329)

## Potential Issues for 108<sup>th</sup> Congress

**NMCI Implementation and Testing.** One potential issue for Congress concerns the Navy’s progress in implementing and testing the NMCI system.

**CEC Block II Acquisition Strategy.** A second potential issue concerns the technical approach for CEC Block II and the Navy’s ability to effectively use competition as part of its acquisition strategy for Block II.

**NFN Acquisition Strategy.** A third potential issue concerns whether the Navy intends to have industry compete for future NFN installations or award an NFN contract to one of them on a sole-source basis.

**Questions concerning NCW in general.** Congress may consider other potential issues relating to NCW in general, including the following:<sup>12</sup>

- *Tactics, doctrine and organization:* The Navy recognizes that it needs to develop new tactics, doctrine, and organizations to take full advantage of NCW; this could significantly alter current practices and pose challenges for retraining Navy personnel.
- *Overall fleet design:* The Navy is currently adding NCW to its existing overall fleet architecture. The issue is whether the Navy has taken the relatively new concept of NCW adequately into account in planning its future fleet architecture.
- *Bandwidth sufficiency:* If Navy transmission bandwidth capacity does not grow sufficiently, or if use of it is not sufficiently managed, implementation of NCW could be hindered.
- *Allied interoperability:* If NATO and other allied navies invest in NCW-enabling technologies, U.S.-allied naval interoperability could be significantly increased; if they do not, maintaining naval interoperability could become increasingly difficult.
- *Information security:* The Navy acknowledges that it needs to work on measures for preventing, detecting, and responding to attempts by outsiders to illegally enter the computer networks being created to implement NCW.

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<sup>12</sup> For discussions of various issues relating to NCW, see Vego, Milan. Net-Centric Is Not Decisive. *U.S. Naval Institute Proceedings*, January 2003: 52-57; Jenik, Douglas A. Beyond the Rose-Colored Glasses. *U.S. Naval Institute Proceedings*, February 2000: 60-63; Barnett, Thomas P. M. The Seven Deadly Sins of Network-Centric Warfare. *U.S. Naval Institute Proceedings*, January 1999: 36-39.